

S. rajasthanensis Gena, Bhardwaja & Yadav in general appearance, but is very different from the latter in habitat (erect vs prostrate), branching (repeated vs uncommon), rhizophores (basal vs throughout), lateral leaf (acute vs obtuse), sporophylls (ciliated vs serrate).

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9. REDISCOVERY OF ENDEMIC *USNEA* SPECIES FROM WESTERN GHATS, INDIA

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Introduction

India is known to have eight lichenogeographical regions (Singh and Sinha 1997) (Fig. 1). The diverse climatic and habitat conditions of these regions provide favourable conditions for speciation that leads to endemism.

India has 2,303 lichen species in 305 genera with about 22.5% endemism (Singh and Sinha 2010) and particularly in regions like the Western Ghats endemism is high compared to the other parts of the country. The region enjoys tropical climate and is one of the richest lichen sites of India. 800 species have been reported from this region, of which 219 species, i.e. 27.27% of total lichen flora at regional level and 10.68% at national level, are endemic (Singh *et al.* 2004).

The statistic of endemism, as well as distributional records, of many species is subject to change as some of these are known only from a single collection, and type locality, (Singh *et al.* 2004). Endemic species are most vulnerable to extinction, as they occupy a narrow geographical area or region.

During our several collection efforts in different regions of the Western Ghats, we came across some interesting findings on the lichen genus *Usnea* Dill. ex. Adams. It is

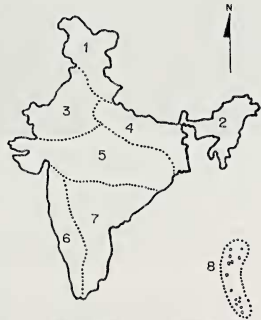


Fig. 1: Map showing Lichenogeographic regions of India (Singh & Sinha 1997)

1. Western Himalaya Region; 2. Eastern Himalaya Region; 3. Western Dry Region; 4. Gangetic plains; 5. Central India; 6. Western Ghats; 7. Eastern Ghats & Deccan plateau; 8. Andaman & Nicobar Islands

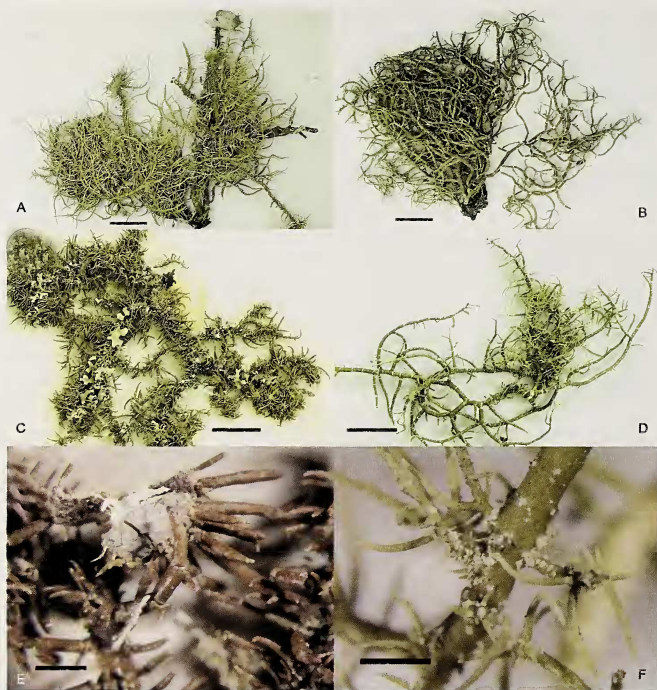


Fig. 2: *Usnea* spp., Habit a-f. a. *Usnea austroindica*, b. *Usnea nilgirica*, c. *Usnea strigosa*, d. *Usnea tumida* (Bar = 10mm), e. *Usnea strigosa* showing apothecia and prominent fibrils, f. *Usnea tumida* showing sorediate isidia (Bar = 1mm)

represented by 338 species globally and in India by 60 species and a variety, of which 18 species are endemic to India. About 12 species of *Usnea* are known only from the Tamil Nadu–Western Ghats of India (Awasthi 1986; Singh and Sinha 2010).

After the monographic work on *Usnea* by Motyka (1936-38), studies on this genus from India were carried out by Awasthi (1986). According to recent trends the generic status and the circumscription of *Usnea* is limited to subgenus *Eumitra* and *Euisnea* (= *Usnea*). Of the known 60 species from India, three species: *Usnea austroindica*, *U. nilgirica* and *U. tumida* were hitherto known only from their type

localities. These species have been recently collected by us from Tamil Nadu.

Though *Usnea tumida* and *U. strigosa* are included in the key to species, their description and illustration are not given by Awasthi (2007). Further, these species have been listed as excluded taxa in the annotated checklist of Indian lichens (Singh and Sinha 2010).

Several records from Tamil Nadu need to be validated by undertaking fresh meticulous surveys; we strongly feel that this effort would certainly clarify the current biodiversity status of many endemic lichen elements. And this will in turn enhance the lichen diversity of India.

A detailed description along with chemical data, and illustrations of *Usnea strigosa* and *U. tumida* (Fig. 2), and diagnostic characters of *U. austroindica* and *U. nilgirica* have been provided for easy identification.

Usnea austroindica G. Awasthi

J. Hattori Bot. Lab. 61: 364. (1986). (Fig. 2a)

Type: India, Tamil Nadu, Shembaganur, alt. 6000 ft, on tree of *Acrocarpus*, 15.xii.1959, Foreau (Holotype: No. 4180A in Hb. Awas.).

Thallus fruticose, corticolous, erect, spiny branchlets not sorediate, dichotomously branched, sympodial, branches spine-like, articulated. Main axis more or less central, verrucose or with depressions, outer cortex orangish-pinkish brown, medulla not hollow, with loose hyphae to thickish, central core which is solid, hyaline to orangish-pink. Pseudocypellae, soredia and isidia absent. Apothecia concolorous with the thallus, large wide open verrucose on the lower side, stalked, with spines all over 3-8 mm wide, concave, white disc, slightly, powdery, margin ciliate, cilia 1-2 mm long; Usnic and barbatic acids present.

The first report of *Usnea austroindica* was in 1959 from Tamil Nadu followed by 1970; it has been collected again in 2010, after about 30 years.

Specimens Examined: India, Tamil Nadu, Kodaikanal, Gundar forest, 9.x.2010, U.V. Makhija & S.B. Gaikwad, 10.480; Kodaikanal, Bryant Park, 9.x.2010, U.V. Makhija & P.S. Khadilkar, 10.102.

Usnea nilgirica G. Awasthi

J. Hattori Bot. Lab. 61: 351, 1986. (Fig.2b)

Type: India, Nilgiri hills (Herb. Ind Or.) *Hook. Fil. & Thomson* 1720 (Holotype: BM).

Thallus erect to pendulous, dichotomous, sympodial branching, ends tapering, pointed, articulated, isidiate, with white patches all over and also minute spiny outgrowths seen from it, soredia absent; papillate, main axis more or less circular, cracked in outline, with spines on the outer side, cortex with hyaline to brownish chondroid tissue, medulla partially hollow, interwoven, central axis solid, I-. Apothecia not seen; Usnic, protocetraric and barbatic acids present.

This species has been collected recently, after 14 years, in 2010 during our extensive field survey in Tamil Nadu. The species was, so far, known only from its type locality – Nilgiri hills.

Specimens Examined: India, Tamil Nadu, Ooty-Pykar, 11.x.2010, U.V. Makhija & M. Morey, 10.607, 10.611, 10.612, 10.614; U.V. Makhija & P.S. Khadilkar, 10.582, 10.583.

Usnea strigosa (Ach.) Eaton

In: Man. Bot. ed. 5., 1829 p 431 (Fig. 2c,e,f)

= *U. florida* var. *strigosa* Ach. *In: Method. Lich.*, 1803, p. 310 tb. VI-fig.3 (haud exacta!).

Type: In: H locality-Jamaica *secundum schedam; Secundum opera Acharii America septentrionalis*, Swartz.

Thallus corticolous, fruticose, erect, 4-7 cm long, with excurrent branching, olivaceous green to brownish; base short, rigid not attenuated; branches terete (appear angular due to thick cover of fibrils), 0.7-1.3 (-1.5) mm thick, gradually attenuated towards the apices, esorediate, tuberculately verrucose (may be due to emerging stiff fibrils). Thallus covered by stiff, rigid short, spinuliform fibrils. Apices terminated by apothecia. Cortex reddish-brown, 90-(100) 144 µm thick; medulla white, compact, red at periphery, 234-450 µm thick, central axis hyaline, solid, 450-486 µm in diam. Without isidia and soredia. Apothecia 2-8 mm in diam., terminal; disc concave to plane, brownish to pale yellow, white pruinose; exciple smooth but wrinkled in juvenile and spinulate in adult apothecia; marginal cilia exactly similar to fibrils; ascospores simple, hyaline, ellipsoid, 8.4-10.6 x 6.3-8.4 µm; Usnic acid, norstictic acid (minor) and salazinic acids present.

Usnea strigosa (Ach.) Eaton has been excluded (Awasthi 1986) and the same has been followed till date (Awasthi 2007; Singh and Sinha 2010). It is commonly known as the busy beard lichen and four different chemical strains have been reported (Hale 1962). The species was earlier reported by Hue and Jatta from Himalayas (Hue 1899; Jatta 1911). Later Moreau reported it from Kodaikanal as *Usnea florida* var. *strigosa* (Moreau and Feraud 1952). The species has been widely distributed in North America (Brodo *et al.* 2001).

Specimens Examined: India, Tamil Nadu, Sims Park, Coonoor, Nilgiris, 16.ix.1973, P.G. Patwardhan & M.B. Nagarkar, 73.787.

Additional Specimens Examined: Louisiana State University Herbarium, Lichens of Texas, Hardin Co.: Pine Island Bayou floodplain just south of farm road 770 bridge, about 6 miles west of Saratoga. Palmetto-hardwood forest, 26.xi.1976, Coll: Cynthia Trxell 601; Ex Duke University Herbarium, North Carolina. On dead branches of *Prunus*, 4 miles south-east of Rolesville, Wake Co., Oct 1955. W.L. Culberson No. 4746.

Usnea tumida Mot.

Lich. Gen. Usnea Monogr., fasc. 3, 611 (1938). (Fig. 2d)

Type: Japonia, *loco exactius non indicato, Locus classicus: Wichura*. *In: Museo Botanico Berlin.*

Thallus fruticose, corticolous, 5-7.5 cm tall, pale to slightly dark green, sorediate-isidiate, dichotomously branched

up to the apices, sympodial, isotomic, 1-2.5 cm in diam., unevenly branched, branchlets sorediate, tapering at the apex; main axis slightly circular to angular in cross section, uneven, rough, articulated; outer cortex hyaline, not pigmented, prosoplectenchymatous, non-transparent, 30-37.5 μm thick; algal layer green, 12.5-25 μm thick; medulla solid in structure but also loosely arranged 200-212.5 μm thick; central axis solid hyaline, 150 μm thick. Apothecia not seen; Stictic, constrictic, conorstictic, usnic acid, sometimes consoromic, norstictic, protocetraric and salazinic acids seen. Collected from the Nilgiri forests at an altitude of 2,300 m.

In the monographic work of Motyka (1936-38) *U. tumida* is reported from the Nilgiri hills of India, but its chemical data is not available. However, Awasthi (2007) included it only in the key. The species is now reported by us

from this region, after a lapse of 73 years from Gundar forest of Kodaikanal (c. 2,133 m). This species is distributed only in Tamil Nadu and outside India in Japan, Madagascar and Sumatra.

Specimens Examined: India, Tamil Nadu, Kodaikanal, Bryant Park, 8.x.2010, U.V. Makhija & P.S. Khadilkar, 10.103; Kodaikanal, Gundar forest, 9.x.2010, U.V. Makhija & S.B. Gaikwad, 10.473, 10.475, 10.476, 10.478, 10.479, 10.479, 10.483, 10.485, 10.486.

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